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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/735,862 | 12/12/2003 | Hong Po | NU-208WO-1 | 3189 |

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| EXAMINER | |
|---|---|
| PAK, SUNG H | |
| ART UNIT | PAPER NUMBER |
| 2874 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | NOTIFICATION DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 02/02/2007 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 02/02/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/735,862 | PO ET AL. | |
| | Examiner | Art Unit | |
| | Sung H. Pak | 2874 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *19 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-96* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-33 and 92-96* is/are allowed.

6)☒ Claim(s) *34-91* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/24/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/19/2006 has been entered.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 34-64, 66-71, 85-91 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacCormack et al (US 6,407,855 B1).

MacCormack discloses an optical fiber with all the limitations set forth in the claims, except it does not explicitly teach the use of more than two pairs of reflectors overlapping in a manner claimed in the instant application.

Specifically, MacCormack discloses a system comprising an optical fiber comprising a gain medium having a Raman active material with a Raman gain spectrum, the optical fiber being configured to receive energy at a pump wavelength $\lambda_p$ (abstract); at least two pairs of reflectors disposed in the optical fiber, each pair of reflectors forming a resonance cavity with a resonance frequency, each resonance cavity having an index, the index of each resonance cavity being different than the index of the other resonance cavities (Fig. 4, column 8 lines 42-48); wherein for a resonance cavity having an index with a value M, M being an integer having a value of at least one, the resonance cavity has a resonance frequency ($c/\lambda_{sm}$), where $\lambda_{sm}^{-1} = \lambda_p^{-1} - \lambda_{rm}^{-1}$, wherein ($c/\lambda_{rm}$) is a frequency within the Raman gain spectrum of the Raman active material contained in the gain medium and c is the speed of light (column 5 lines 4-19); and for a resonance cavity having an index with a value N, N being an integer having a value of at least 2, the resonance cavity has a resonance frequency ($c/\lambda_{sn}$), the resonance cavity having the index with the value N overlapping only with a resonance cavity having a resonance frequency ($c/\lambda_{s(n-1)}$) and with a resonance cavity having a resonance frequency ($c/\lambda_{s(n+1)}$) wherein the resonance cavity having the highest value for N overlaps with at most one other resonance cavity (Fig. 4 and column 8 line 42- column 9 line 3); wherein at least one pair of reflectors has a first reflector and a second reflector, the first reflector being disposed in the optical fiber claoser to a

point where energy at wavelength $\lambda_p$ enters the optical fiber than the second reflector, the second reflector being configured to reflect only a portion of energy impinging thereon at the resonance frequency for the resonance cavity formed by the at least one pair of reflectors (column 8 line 42- column 9 line 3); wherein the first reflector is configured to reflect substantially all energy impinging thereon at the resonance frequency for the resonance cavity formed by the at least one pair of reflectors, and the second reflector is configured to partially reflect of the energy impinging thereon so that it acts as an output coupler (column 8 lines 42- column 9 line 3); wherein there is an additional reflector disposed in the optical fiber, the additional reflector being configured to reflect energy impinging thereon at wavelength $\lambda_p$ (Fig. 4); wherein at least one of the pairs of reflectors comprise pairs of Bragg gratings (column 5 lines 35-36).

Regarding claims 88-91, MacCormack discloses controlling the power of output wavelength relative to the power of the pump wavelength (column 6 lines 5-24).

Regarding claims 13, 21, 54, MacCormack discloses the use of wavelength tunable reflectors (column 2 lines 28-29).

Regarding claims 22, 23, 55-57, MacCormack discloses the use of long period grating for suppressing formation of energy at frequency in Raman gain spectrum of the active material in the gain medium in the fiber (column 6 lines 5-24).

However, MacCormack discloses the use of two pairs of reflectors in this configuration (Fig. 4). Nevertheless, it is well known and common in the art to use three or more pairs of reflective gratings in Raman fiber lasers. Plurality of pairs of reflective gratings provide plurality of resonance cavities which enable the fiber laser to output plurality of wavelengths for

more robust optical applications. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the MacCormack device to have more than three pairs of reflective gratings.

Claims 65, 72-84 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacCormack et al (US 6,407,855 B1) in view of Dianov et al ("Three-cascaded 1407-nm Raman Laser Based on Phosphorus-doped Silica Fiber").

MacCormack discloses an optical fiber device with all the limitations set forth in the claims as discussed above, except it does not explicitly teach the use of $GeO_2$ and/or $P_2O_5$ as Raman active materials.

Dianov, on the other hand, explicitly teaches the use of $GeO_2$ and $P_2O_5$ as Raman active materials in optical fiber lasers (abstract). It is taught that the use of $GeO_2$ and $P_2O_5$ are advantageous and desirable because the resulting optical fiber lasers are able to generate optical signal with desirable wavelengths with few number of conversion cascades (page 402, paragraph 3). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the MacCormack device to have $GeO_2$ and $P_2O_5$ as Raman active materials.

### *Allowable Subject Matter*

Claims 1-33, 92-96 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: Applicants' arguments for patentability of above-mentioned claims, filed on 11/19/2006 are

convincing. Specifically, on pages 21-22 of the applicants' response, it is argued that the claimed recitations necessarily leads to a relationship, where the resonance wavelength of the second cavity becomes a function of at least the resonance wavelength of the first cavity, wherein energy having the resonance wavelengh of the first cavity pumps the second cavity. Such claimed relationship, in conjunction with the rest of the claimed structures of the above-mentioned claims, have not been disclosed by any prior art of record.

***Response to Arguments***

Rejection of claims 34-68:

Starting on page 23 of the applicants' response (filed 11/19/2006), it is argued "MacCormack even as it is proposed to be modified in the Office Action... still cannot meet all of the claim limitations of independent claim 34." (first paragraph, page 24 of applicants' response). Specifically, it is argued that MacCormack reference does not disclose an optical fiber "substantially devoid of a location that is included in more than two of the resonance cavities" as recited in claim 34.

The examiner respectfully submits that applicants' assertion is simply incorrect, and that MacCormack, as it is proposed to be modified in the Office Action meets all of the claim limitations of independent claim 34. As discussed in prior office actions, Figure 4 of the MacCormack explicitly and unequivocally discloses optical fiber that is substantially devoid of a location that is included in more than two of the resonance cavities, as claimed in claim 34. That is because grating elements "42A" and "42B" forms one resonance cavity and grating elements "44A" and "44B" forms another resonance cavity (also see column 8 lines 42-58). Therefore,

MacCormack reference, as it is proposed to be modified in the office action, fully meet all the claimed limitations of independent claim 34.

Rejection of claims 69-87:

Applicants' arguments for patentability of these claims are essentially identical to the arguments made for claim 34. The examiner respectfully submits that claims 69-87 are properly rejected as discussed above.

Rejection of claims 88-91:

Starting on page 25 of the applicants' response, it is argued "[t]he Office Action... fails to provide any reasonable rational or technical reasoning to support the proposition that the requirement in claims 88-91 that the ratio of the output power to input power be at least about 20% of a theoretical limit would necessarily flow from MacCormack." (last paragraph, page 25-first paragraph, page 26)

The examiner respectfully submits that the claimed limitations in question (the ratio of the output power to input power being at least about 20% of a theoretical limit) IS NECESSARILY disclosed and flows from the disclosure of the MacCormack reference. Specifically, MacCormack explicitly discloses that the power of the output wavelength is fully controlled via the use of long period grating, as discussed in prior office actions (column 6 lines 5-24 of MacCormack). Therefore, the ratio of output power disclosed by MacCormack includes 0% to 100% of the theoretical limit and necessarily includes "about 20%" claimed in the instant application.

Further, the examiner respectfully submits that the claim limitation in question, i.e. "wherein plurality of reflectors are configured so that when the optical fiber receives energy... a ratio ... is at least 20% of a theoretical limit..." as claimed in claims 88 and 89, is a FUNCTIONAL LIMITATION within the meaning of MPEP §2114. That is, the "apparatus" claim of claim 88 (or claim 89) is limited by functions performed by a claimed element.

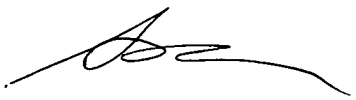
As stated in MPEP §2114, "[w]hile features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function." *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997). A claim containing "a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). As such, while the functional language limitations are ***not ignored***, such limitations are not given patentable weight, and the claimed limitations are anticipated if a prior art apparatus is ***capable*** of performing the claimed function. MPEP §2114. Since the device of MacCormack is fully capable of performing the function as recited in claims 88-89 as discussed above, the claim rejection based on MacCormack is proper.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sung H. Pak whose telephone number is (571) 272-2353. The examiner can normally be reached on Monday- Friday, 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571)272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Sung H. Pak
Primary Patent Examiner
Art Unit 2874